MuniWireless

March 2006
Issue 001

The Voice of Public Broadband
www.muniwireless.com

Behind the Boom in Mesh Networks

Bringing Public Broadband to Phoenix

Big Cities: Bridging the Digital Divide

Preview Issue
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after P.6

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welcome.

The first issue of a magazine is always the most challenging, but also the most fun. Because *MuniWireless Magazine* has no past, there's no existing template to adhere to and no angry loyal readers to placate whatever you decide to do. Although everything seems possible, I decided that the guiding principle for the magazine would be the same one that guides the Web site: It has to be useful.

When I started MuniWireless.com in June 2003, I had a feeling that WiFi would move out of the home, the office and the café, and would one day cover entire cities. My hunch was not based on a wild dream. Cities such as Long Beach, Calif., were already deploying downtown hotzones. I asked: Why can't we have citywide coverage?

In 2003, if a city decided to build a citywide WiFi network, there was no comprehensive online resource for the CIO to find out what other cities were doing, how much these networks cost to build and who sold networking equipment. I decided to start a Web site that would make it easy for cities to obtain that information. In doing so, I hoped to be useful. Three years later, MuniWireless.com has become the online resource for cities and regions deploying wide-area wireless broadband networks. And, indeed, the number of cities and regions building out networks has increased dramatically since I started.

Last spring, I sensed that a Web site alone run by a person in her pajamas would not serve the needs of cities and regions. I began thinking about getting others to help me expand MuniWireless beyond the Web site to meet those needs. So I decided to partner with Microcast Communications to bring MuniWireless to the next level. Together we organized a terrific conference in San Francisco last September—an event that drew 325 people—and brought together municipal wireless fans from as far as Hong Kong. This year we have conferences in Atlanta and Silicon Valley, plus a fall conference in Minneapolis.

So why the magazine? I must admit that publishing a magazine was the last thing on my mind. When my partners at Microcast suggested a magazine, I thought, "What an old-fashioned notion! Isn't this the Digital Age? Isn't all publishing moving to the Internet?"

But then I realized that I continue to buy books and love the physical aspect of reading. We are tactile beings. We like to hold on to physical things. With a magazine, you can feel the gloss of the paper, hear it crunch when you turn the pages, stuff the entire thing in your bag and carry it onto a train or airplane. You can show it to people without having to turn on a device.

Another thing: A magazine feels REAL. And municipal wireless, which continues to draw cynical remarks from telcos and mobile operators, is REAL: Not just to city CIOs planning large, complex projects, but to community wireless activists who have been at the forefront of this movement; families who have no access to affordable broadband; businesses trying to meet the challenges of global competition; educators finding a way to reach their students; police officers protecting the community, and municipal officials working to find a way to make government more efficient and responsive to citizens.

The magazine is their resource and their voice. Through it, I hope to reach people who have not yet visited the Web site. For those who read my online posts regularly, the in-depth articles will be a welcome read.

Finally, I wish to thank Motorola for its support in helping me publish this preview issue. Publishing—whether online or in print—takes a lot of energy and time. I could not have lasted three years without the help of those whose products and services make municipal wireless networks a reality.

I hope you find the magazine valuable and pass it around to your friends and colleagues. Do tell us how we can improve it and what we can do to make it useful. MW

Esme Vos

—Esme Vos, Founder
MuniWireless.com

ROSALIE SOLLEVELD

COVER STORY

safety first.

page 10 **Focusing on "first response," disaster recovery and homeland security to kickstart your public wireless initiative**

by Eric Hellweg

TO OUR READERS:

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Forms are available online at www.muniwireless.com/magazine. There are also two subscription forms in the magazine, following pages 6 and 30. If you prefer, you can fill out one of these and send it by postal mail. Please feel free to pass on subscription cards to colleagues as well.

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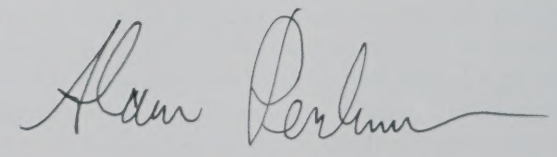
Starting now, *MuniWireless Magazine* will be published quarterly. Our next issue will come out in June 2006. For details on our publishing schedule, editorial calendar and advertising opportunities, please go to www.muniwireless.com/magazine.

We hope you enjoy *MuniWireless Magazine* and choose to subscribe. Please send comments and suggestions to editor@muniwireless.com.



—Al Perlman, Publisher

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TOBIAS BERNHARD

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The Voice of Public Broadband

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FREE DOWNLOADS

February 2006 List of U.S. Cities and Regions. This is an update to our free July 2005 market report. It includes 56 cities and regions with muniwireless implementations; 29 hotzones; 42 public safety and municipal-use only networks, and 59 citywide or countywide projects that are either in the deployment phase or the RFP stage.

RFP Heaven. This is an assemblage of requests for proposals from various municipalities for their city wireless broadband projects. These municipalities are Hermosa Beach, Calif.; Los Angeles Pershing Square hotzone; Lompoc, Calif.; Rome, Ga.; Muskegon, Mich.; Fullerton, Calif.; Seattle Monorail, and Dunedin, Fla.

FEATURE SECTIONS

Municipal Wireless: Regulatory projects, policies and legislation

Community: Social relevance and impact on everyday life

Applications: Practical implementations of wireless at work

Technology: News, information and recent developments

CONFERENCES

MuniWireless 06: Silicon Valley
June 19-21, Marriott Santa Clara

MuniWireless 06: Midwest
Oct. 24-25,
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tales of the cities.

As muniwireless goes metro, its impact will be far-reaching by Esme Vos

MUNICIPAL WIRELESS STARTED OUT IN THE sticks—in rural towns and small cities where there was no broadband service and, it seemed, no possibility for high-speed Internet access.

In the first two years I ran MuniWireless .com, almost every deployment took place in a small community that had no other choice but to roll out a cheap broadband solution to serve residents and businesses. In towns such as Scottsburg, Ind., the municipal government was forced to build its own citywide WiFi network to stop local businesses from closing and moving away.

Munipioneers, clockwise from top left: Philadelphia, Houston, San Francisco and Minneapolis.

In early 2005 I predicted larger cities would get into municipal wireless slowly and we would not see big projects until the end of 2006. It made sense at the time: Philadelphia was the only large city in the United States that had issued an RFP for a citywide network. Because municipalities tend to be cautious, I believed they would wait for Philadelphia to complete its project before venturing out on their own.

I was wrong. By the end of 2005, Portland, Ore., San Francisco and Minneapolis had issued RFPs. Tempe, Ariz., has already deployed a running network, Sacramento is in deployment phase and Houston has announced that it will issue an RFP. With all of this activity and uncertainty, the deployment of WiFi networks that cover large metropolitan areas is the most interesting, and surprising, municipal wireless trend to watch in 2006.

What's driving these cities, many of which have adequate broadband service (expensive as it may be compared to cities in Europe and Asia)? What impact will these big city deployments have on the way people work, the products and services they use, the relationships they have with one another and with their government?

Most city officials say they want citywide WiFi service for three reasons: (1) to bridge the digital divide; (2) to create a competitive environment for broadband service (to drive down prices and increase bandwidth), and (3) to improve city government services.

In cities such as Philadelphia, there is adequate broadband service if you live in a middle to upper-middle class neighborhood. Where there are many low income families, broadband service is largely non-existent. This is because the service providers do not want to invest in broadband infrastructure where the residents cannot afford to pay more than $25 per month for service. Large areas of Philadelphia are broadband "black holes."

If one believes that employment chances in this global economy depend on one's access to high-speed broadband service, then the poor of Philadelphia and many other cities are doubly disadvantaged: By their inability to use computers and the absence of broadband. Wireless Philadelphia, the non-profit organi-

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1. What is the primary activity of your organization? (select one only)

- ☐ 01 Municipal Government (Town, City, County, or other local or regional)
- ☐ 01 State Government
- ☐ 02 Federal Government
- ☐ 03 Telecommunications Service Provider
- ☐ 04 Internet Service Provider
- ☐ 05 Wireless Internet Service Provider
- ☐ 06 Value-Added Reseller/Systems Integrator
- ☐ 07 Hardware/Software Manufacturer
- ☐ 08 Consultant
- ☐ 09 Education
- ☐ 10 Media
- ☐ 11 Investment/Financial
- ☐ 12 Lobbyist
- ☐ 13 Community Advocate
- ☐ 14 Other (please specify)_____
- ☐ 15 None of the above

2. What is your primary job function? (select one only)

IT

- ☐ 16 CIO, CTO, CSO
- ☐ 18 VP/EVP/Director of IS
- ☐ 19 Network Manager, Telecommunications Manager
- ☐ 21 Engineering Manager
- ☐ 22 Other Information Technology Management
- ☐ 23 Information Technology Staff

Government

- ☐ 24 Elected Official (Mayor, Council Member, e.g.)
- ☐ 25 Non-Elected Official (Police/Fire Chief, Building Inspector, e.g.)
- ☐ 26 State/Local Regulator
- ☐ 27 Federal Regulator

Business

- ☐ 28 Chairman, CEO, President, Owner, Principal Partner
- ☐ 29 Controller, Treasurer, CFO
- ☐ 30 Vice President, General Manager
- ☐ 31 Technical, Engineering
- ☐ 32 Marketing, Sales
- ☐ 33 Other Business

Influencers

- ☐ 34 Consultant
- ☐ 35 Analyst/Financial Investor
- ☐ 36 Journalist

- ☐ 37 **Other** (please specify)_____

3. If you are with a municipality, what is the status of your municipality's broadband wireless network? (select one only)

- ☐ 38 Already up and running
- ☐ 39 Plan to install within the next year
- ☐ 40 Plan to install within two years
- ☐ 41 Plan to install with no time frame
- ☐ 42 Thinking about it, but no specific plan to install
- ☐ 43 Other (please specify)_____

4. What is the approximate population of the community the network serves/will serve? (select one only)

- ☐ 44 More than 1 million people
- ☐ 45 500,000 to 1 million
- ☐ 46 250,000 to 499,999
- ☐ 47 100,000 to 249,999
- ☐ 48 50,000 to 99,999
- ☐ 49 25,000 to 49,999
- ☐ 50 10,000 to 24,999
- ☐ 51 Less than 10,000

5. What technologies/platforms/services are you using and/or considering for your municipal broadband network implementation? (select all that apply)

		Using	Considering
☐ 52	Mesh Networks	A ☐	B ☐
☐ 53	WiMax	A ☐	B ☐
☐ 54	Security Products	A ☐	B ☐
☐ 55	Customer Premises Equipment	A ☐	B ☐
☐ 56	Back Office Equipment	A ☐	B ☐
☐ 57	Consulting Services	A ☐	B ☐

- ☐ 58 Other (please specify)_____

6. What applications are you using and/or considering for your municipal broadband network? (select all that apply)

- ☐ 59 Public Safety
- ☐ 60 Education/Training
- ☐ 61 Asset Tracking/SCADA (Supervisory Control + Data Acquisition)
- ☐ 62 Building Inspection
- ☐ 63 Utilities/Public Works
- ☐ 64 Hospitality/Visitor Services
- ☐ 65 Residential Public Access
- ☐ 66 Business Public Access
- ☐ 67 Homeland Security
- ☐ 68 Disaster Recovery
- ☐ 69 Other (please specify)_____

7. Approximately how much is your municipality planning on spending for municipal wireless networks in the next 12 months? (select one only)

- ☐ 70 less than $10,000
- ☐ 71 $10,000 to $24,999
- ☐ 72 $25,000 to $99,999
- ☐ 73 $100,000 to $499,999
- ☐ 74 $500,000 to $999,999
- ☐ 75 $1 million to $2.499,999 million
- ☐ 76 $2.5 million to $499,999 million
- ☐ 77 $5 million or more
- ☐ 78 None of the above

8. What is the scope of your purchase authority for your installed or planned municipal broadband networks? (select all that apply)

- ☐ 79 Approve purchases
- ☐ 80 Approve vendors
- ☐ 81 Evaluate vendors
- ☐ 82 Prepare/write RFPs
- ☐ 83 Recommend requirements
- ☐ 84 Recommend vendors
- ☐ 85 None of the above

DON'T GET LEFT BEHIND...

The proliferation of municipal wireless is one of the most compelling technology stories of our time. MuniWireless.com is the #1 source of news and insight for municipal officials, regulators, technology vendors, investors and anyone else who needs to stay abreast of public broadband initiatives worldwide. In addition to MuniWireless.com and MuniWireless Magazine, you can keep up with the rapidly changing MuniWireless market by checking any of the following:

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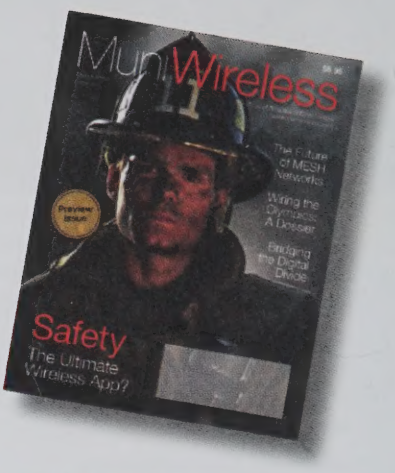
- ☐ 90 Free product information



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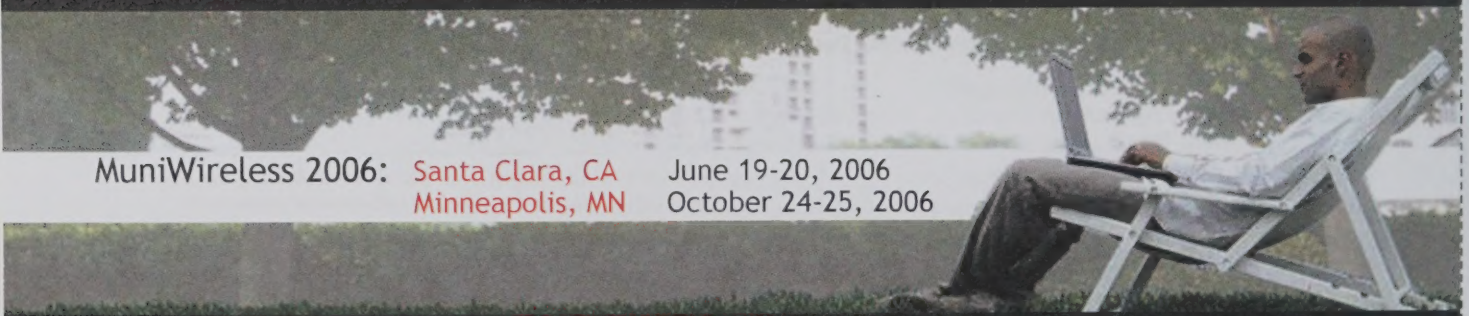

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zation that is leading the city's WiFi project, plans to provide low-cost computers and training to low income families, in addition to ensuring that there is good, cheap broadband service in their neighborhoods.

Philadelphia's plan is a model that many other cities have adopted in their own WiFi deployments. There is a twist: Philadelphia does not want to spend tax money on building out the broadband network, so it has partnered with EarthLink, a large ISP that will own and run the network. Under terms of the deal, EarthLink has to provide wholesale access to other ISPs. The city placed this requirement in the RFP to guarantee that there is a large number of service providers that residents and businesses can choose from. The presence of a large number of ISPs ensures competition—lower prices, higher bandwidth. This is a model that has worked well in Europe and Asia, where people pay a fraction of what Americans pay for broadband, and for more bandwidth.

In addition to creating a competitive environment for broadband service, cities want to streamline government operations and cut costs. Philadelphia estimates that in the first year alone, the citywide wireless network will save them $2 million in telecommunications costs. How is that possible? Philadelphia will cancel subscriptions for T-1 lines and GSM data plans.

Most city officials say they want citywide WiFi service for three reasons: (1) to bridge the digital divide; (2) to create a competitive environment and (3) to improve city government services.

Cities also realize that with a citywide WiFi network in place, building inspectors can do their work in the field without returning to the office several times a day to download files or write reports. Police officers can access local and state databases more effectively—photos of suspected criminals download more quickly on a fast wireless connection than on an ancient CDPD device. Fire fighters can view building plans and permits on the way to a fire. Cities can also monitor water towers, sewage facilities, electrical substations and other utility plants more cheaply and effectively via a wireless network. With the price of gasoline rising, any way to decrease senseless driving saves a lot of money.

And what is the impact of these large city deployments? The ubiquity of wireless broadband in areas with large population densities will encourage manufacturers such as Apple and Nokia to develop portable WiFi devices that allow people to call for free on the network, browse Web pages, download e-mail, read blogs, listen to podcasts, and send and view video and photos. This year we will see the first generation of WiFi-enabled mobile phones that allow the user to move seamlessly between a mobile and a WiFi network. We have already seen how quickly the iPod took the market by storm. The ubiquity of wireless broadband will have a similar effect on WiFi devices, be they WiFi mobile phones or tablets.

Beyond that, I cannot predict how people's behavior will change. But change it will. Just as the wired Internet changed how people look for jobs and apartments, spouses and used furniture, so will the ubiquity of broadband—thanks to citywide wireless networks. MW

wigle room.

Want to know what kind of reported WiFi access point penetration your area has? Check out www.wigle.net, which offers an interactive map showing publicly listed hotspots. The site boasts more than 5 million reported hotspots in its database. You can't always count on specific locations—the San Francisco Bay Area apparently boasts a number of hotspots in the middle of the bay, for example—but it can be a useful tool to help look at existing WiFi density.

The island of Manhattan, one of the densest points of observed networks in the WiGLE world.

TRENDWATCH*

*with apologies to *Wired Magazine*

WITLESS	WIRELESS
Proprietary	Open
Tethered	Mobile
Single provider	Federated
Traditional WiFi	Mesh
Single-purpose	Multi-purpose

will wireless suburbs make a mesh of NY?

With more than 1.5 million residents, Suffolk County is as populous as Phoenix, Ariz., the country's fifth-largest city (see Dossier on page 28). Now, if county leaders have their way, they'll soon be taking steps to develop a request for proposals (RFP) for countywide WiFi spanning Suffolk's 900-square-mile geography.

Suffolk, located outside New York City on densely populated Long Island, is putting together a committee comprising local government, business executives and community leaders to develop a comprehensive blueprint for countywide WiFi, hopefully resulting in an RFP by year's end, according to the county's chief information officer, Sharon Cates-Williams. While there's a lot of detail work still ahead, Cates-Williams says the business model is likely to be some form of partnership between the county and the private sector: "We don't want the taxpayers to foot the bill at all."

While countywide WiFi is not new—major counties in Michigan, Washington and Texas are among those planning municipal wireless—Suffolk could represent one of the country's largest countywide deployments if it comes to pass. Perhaps even more important is the potential ripple effect Suffolk's decision could prompt with other major counties such as neighboring Nassau County on Long Island, Bergen and Passaic in northern New Jersey, and Westchester and Rockland just north of New York City. It may not be unrealistic to envision a time in the near future when the entire metropolitan New York area evolves as a virtual "wireless metropolis," centered on New York City but emanating out 100 miles in any direction. **MW** —*Mike Perkowski*

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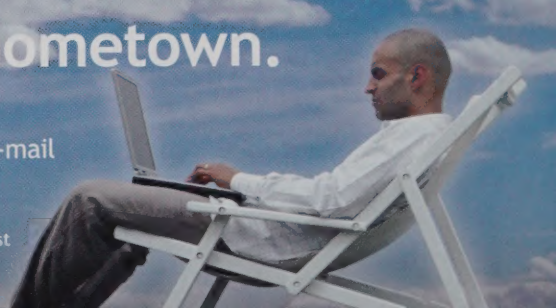

what munis want.

Using public wireless to cross the digital divide

by Mike Perkowski

WHAT IS THE BIGGEST BENEFIT OF DEPLOYING A MUNIWIRELESS network?

It's one of the first questions municipal officials ask when they begin thinking about public broadband for their communities. Here's the answer, from those who have networks or are planning them:

> **Bridging the digital divide for constituents without broadband access.**

A surprise? Not really. After all, bridging the digital divide is the motherhood and apple pie of public broadband. This answer was among several interesting results of a February 2006 poll of 82 visitors to MuniWireless.com. Seventy percent of the respondents cited crossing the digital divide as one of the chief benefits of having a muniwireless network. Respondents were allowed to choose more than one answer. Ranking next were:

- Reduced telecommunications costs: **55.1 %**
- Better utilization of municipal employees and resources: **42.8 %**
- Better constituent service: **40.8 %**
- New sources of revenue: **26.5 %**

We also learned that deploying applications is taking longer than expected, and finding enough political support for the initiatives is also somewhat of a problem.

The median amount of time required to complete a primary application deployment is nine months, with 39 percent of respondents indicating it took or is taking more than a year to implement a first application. The median amount spent on those applications is about $250,000; however, 30 percent of the respondents say they're spending more than $1 million on deploying their primary application.

While the results represent a fairly small statistical sample, the data highlights the prominence of public safety and security as the most prevalent applications in today's market. But the study points out that a number of other applications—such as hospitality and visitor services—also are expected to gain momentum in the coming year. See the chart above for the details. MW

Which of the following applications are planned for deployment on your municipal wireless network within the next 12 months?

a $200 billion phone bill?

Since it was released last month, Bruce Kushnick's eBook on broken promises about U.S. broadband deployment has received a lot of buzz on the Internet.

Q&A

In the book, Kushnick takes the telephone and cable companies to task for what he says is a total of $200 billion that should have been invested in services that never happened. We asked Kushnick what advice he would have for municipalities looking at wireless implementations. Here's his reply:

"America is 16th in broadband because the Bell companies failed to deliver on their promises for 45-Mbps services—which were supposed to be ubiquitous, rich and poor areas, rural and urban areas alike. America should have already been rewired, and yet we have nothing to show for it. If history is our guide, waiting for the Bell companies is waiting for Godot. They can not be trusted with America's digital future, and municipalities should not be fooled by the talk.

Municipalities should stand up to the Bells and do what is right for their constituents. Instead of waiting, the municipalities should call for investigations of the past bad acts, and all of the money that was collected. Don't wait for the phone companies: As history has shown, they will most likely never fulfill their obligations for high-speed services." MW

For more, see www.newnetworks.com/broadbandscandals.htm.

safety first.

Focusing on "first response," disaster recovery and homeland security to kickstart your public wireless initiative by Eric Hellweg

53% of municipal wireless applications deployed in 2005 were for public safety.

Source: MuniWireless State of the Market Report 2005

Scenario One: A fire truck speeds toward a fire a half mile away. One fireman calls feverishly back to the fire station, trying to find someone who knows about the building they're heading toward. Another pores over a map, trying to find a fire hydrant near the building. The truck pulls up to the burning structure, and with a sinking feeling, the ranking officer realizes it's a building that neither she nor any of her team has ever been in before.

Scenario Two: A fire truck speeds toward a fire a half mile away. Using a laptop computer connected to a wide-area wireless network, a fireman downloads blueprints of the building, determining alternative methods of reaching the upper floors. He also checks a database of hazardous materials to determine if any are stored in the area, and locates the nearest fire hydrants with the strongest water streams.

If you're a fireman, it's easy to choose which of these scenarios you'd prefer—and, in fact, that's exactly the way it works now in Oklahoma City, Okla. It's just one of the reasons why public safety is by far the most widely used application for public wireless networks in the U.S. According to MuniWireless' 2005 Municipal Wireless State of the Market Report, 53 percent of public wireless initiatives deployed in 2005 were for public safety: Public works projects were a distant second, with about half that amount.

But safety initiatives aren't for fire departments alone. Consider:

- In Fresno, Calif., moments after a crime is committed, police officers receive mug shots of suspects on the data terminals in their cruisers. Rather than looking for someone with a generic description, they can search for specific individuals.
- In Raleigh, N.C., when there is a car accident, crime or other incident requiring immediate response, police and emergency services dispatchers can tell exactly which squad car or ambulance is closest to the scene and should be dispatched.
- In Buffalo, Minn., officers reporting on-site at routine traffic accidents have converted from laborious paperwork with carbon copies to a Web-based system that lets them enter data and print electronic tickets on-site.
- In Ripon, Calif., immediately following an assault in a skate park last year, police speeding to the scene were able to use laptop computers to view images from wireless surveillance cameras to trace the movements of the perpetrator.

Public safety applications can pave the way for revenue-generating applications.

In fact, a safety application is the first initiative many municipalities are considering for their wireless networks. Why is public safety such a driving factor in the municipal wireless deployments? Several reasons:

1. Many municipalities looking for rapid return on investment (ROI) for their broadband initiatives turn to safety because they often can more quickly gain community support, reduce costs and increase efficiency, compared to other applications.
2. Blanketing high-density downtown areas is a cost-effective use of wireless networks: Where there are more people, there's typically a higher concentration of police activity.
3. Public safety applications can pave the way for revenue-generating applications after the initial infrastructure is up and running.
4. Homeland security offers a new pocket of dollars that can help fund some safety-related initiatives.

In addition, public wireless schemes such as mesh networking, because of their resilience, can be ideal for disaster recovery scenarios where traditional communications networks may temporarily fail. For example, after the Katrina hurricane last year, the city of New Orleans deployed a network covering up to 10 square miles using equipment donated by Intel and Tropos Networks, in part to support the activities of Federal Emergency Management Agency (FEMA) workers. The city announced last November that it is planning on expanding the network to cover approximately 180 square miles.

Doing Safety Safely

Four years ago, Fresno, was one of the first communities to envision a municipal wireless network focused on public safety, according to Patrick Rhames, a police captain who was tapped to serve as the project lead. At first, the city assumed it knew what it needed, writing an RFP (Request For Proposals) for a standard 802.11 wireless network. But that was a non-starter: The thick, leafy trees that bring green to Fresno's desert environs made it impossible for the signals to reach anywhere near the distance promised by the vendor.

"It was a spectacular failure," Rhames admits. "Quite frankly, we didn't know what we were doing."

Defeated by nature, Rhames and his team rewrote the RFP. Instead of detailing the technology solution the team thought they needed, they crafted a list of requirements, such as 90 percent connectivity on major thoroughfares, and a minimum of 100 kilobits per second performance (about double dialup download speeds). And, the system couldn't be unavailable more than one percent of the time. Rhames then asked vendors for the best solution. "We learned the biggest lesson the hard way," Rhames says. "We shouldn't tell the industry what we want. Instead, let's ask what they have that will fit our needs." That shift in approach proved invaluable. Fresno eventually selected IBM Global Services to build the wireless network—three years after Rhames began on the project.

As a police captain, Rhames shouldn't have been expected to know the intricacies of wireless networking technology. But his experience illustrates a key point for municipalities interested in wireless networks for public safety applications: Put together the right team for the job. In Oklahoma City, for example, the task of writing the RFP and building the network was given to the information technology department. "Although the network was purchased for public safety, we designed it with the conceptual foundation of helping all city departments," says Mark Meier, the city's director of information technology. "So we talked to all those groups. But we represented their needs. Ours was a technology-department-led project."

Getting Funded

After defining the need and putting the team in place, the next step is finding the dollars to support it. Options include:

- **ROI.** Under the right circumstances, a safety network and application can be

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BRAIN DRAIN
THIS YEAR
Young people are the future of any community. To help keep their talent and energy from leaving, get them connected. A Motorola Mesh Solutions network helps provide high-speed Internet access to the global economy for all, increased economic development and growing opportunity. With the support of Motorola's 75 years of global wireless leadership, you can move into muni wireless broadband with confidence. Since Motorola's MOTOwi4™ portfolio of solutions is available now, your community can start connecting to the future today... and not be left behind.
Call 1.866.515.5825 / International 1.800.795.1530 or visit us at www.motorola.com/canopy/meshsolutions
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Police in the field can now rapidly submit their reports through the city's secure wireless network.

funded by the cost savings such a system can provide. Police Chief Mitch Weinzetl reports that Buffalo, Minn., a city of 14,000, is getting a strong ROI from its network by reducing officer time on routine reporting such as traffic accidents. "It takes us five minutes now, as opposed to 25 to 30 minutes" to do a single report, he says. At an average of 400 vehicle crashes a year, that's a predictable amount of savings. And the system has been operational for over a year.

- **The private sector.** If your municipality is populous enough, you may be able to attract private companies that would set up your network essentially free of charge, in exchange for the ability to offer wireless Internet access to your citizens. This approach can involve very little money up front—and significantly fewer headaches down the road, when the network needs maintenance or upgrading. Wake County, N.C., opted for this approach in a partnership with Sprint, in exchange for the right to sell wireless access to residents. The county only had to purchase modems for its police cars and ambulances.
- **Departmentof Homeland Security (DHS) grants.** DHS money is available for certain safety-related projects. But municipalities considering this route should budget a lot of time to secure that funding, says Lori Sandoval, the IT planning and project manager for Pasadena, Calif. Currently in the RFP process for a wireless network project, Pasadena had considered DHS grant money to help fund their initiative —but decided against it. "Identifying funding through the DHS was a maze," she warns. "We looked into it, but decided to go the private sector route."
- **Allof the above.** Ripon used a multi-faceted approach to funding. "We got a small grant from DHS, a private grant from Pacific Gas and Electric, and the rest was funded through our city's general fund," says Richard Bull, Ripon's chief of police. "We're using this for all city agencies, however, which allowed us to spread funding." Ripon uses a mesh network from Motorola, and has a three-year maintenance contract with Lockheed Martin.

Using It Safely

Once the network is operational, some municipalities may be concerned that they'll be unable to get their first-response "customers"—fire and police personnel, who may be entrenched in old ways of doing things—to actually use the network. But reports from the field show exactly the opposite.

Asked if he has any trouble getting departments to actually use the system he spent two years planning, funding and building, Oklahoma City's Meier says he can hardly keep them off the system. Ripon's Bull says that, like the Buffalo system, his police in the field can now rapidly submit their reports through the city's secure wireless network. "They love that," he says. And Wake County IT assistant director John Higgins says that when the project went live last October, the response was overwhelming.

"It's gone very, very well," reports Higgins. "Everyone is using it very heavily." MW

Safety By the Numbers

Municipality: Buffalo, Minn.

Population: 14,000

Network coverage: 10 square miles

Components: 80 remote access points, 8 intelligent access points, operating in the 2.4-GHz range

Performance: Strong; Consistent speeds of 500-800 kbps

Software: Web-based records system (traffic tickets, etc.)

Project Lead: Mitch Weinzetl, Chief of Police, mitch.weinzetl@ci.buffalo.mn.us

MOTOROLA

Will the Revolution Start Without You?

Wireless broadband networks are already starting to revolutionize the way people in communities all around the world live and work. Motorola discusses market realities and cost-effective solutions for municipalities of all sizes to get started on building a municipal wireless broadband network immediately.

The Revolution: Why?

The wireless broadband revolution is no longer a dream or a futuristic "what if." It's now a reality. All around the globe, a fast-growing number of municipalities and service providers of all sizes are already deploying municipal broadband networks. Hundreds more of you are requesting proposals or seriously exploring the benefits of municipal wireless broadband. It's clear that the time for the revolution is now.

Broadband Connectivity

The revolution is about connectivity. It's about your opportunity to install one network that meets all your public safety, public works and public access needs. It's about providing high-speed Internet access not just for business and the affluent... but for everyone. It's about the ability to offer innovative services—such as Voice over IP (VoIP), video surveillance and location-based services—both in fixed locations and on the go. It's about deploying a scalable system that provides indoor and outdoor service, with nomadic and mobile broadband. It's about building a network that helps conquer the digital divide, encourage economic development and streamline public service. It's about delivering benefits you can't ignore.

> "Nothing says 'progressive' like a connected community."

Benefits

Municipalities of all sizes—from teeming metropolises to sparsely populated rural counties—are all facing challenges similar to yours. You need to spur economic development to grow and remain viable. You need to bridge the digital divide between the affluent and the economically disadvantaged to increase opportunity for all. You need to provide more efficient public safety and public works services at lower costs. You need to create a greater sense of community among all residents. A wireless broadband network can help you with each of these challenges.

- Improved Business Development. In today's world, how many businesses can operate without broadband? The fact is, for virtually all businesses, nothing says "progressive" like a connected community. A muni wireless network helps attract new businesses to spur economic growth, and new residents to ensure a vital, energetic and involved populace.
- More Efficient and Effective Public Services. A desire to reduce costs in municipal services such as public safety, public works and public access drives many municipalities to consider a wireless broadband network. Supplying workers (such as meter readers and building inspectors) with mobile access saves money by reducing the number of truck rolls and increasing field productivity. Even more important, instant access and monitoring of safety operations (including police, fire and EMT services) not only increases efficiency but can also save money.
- Increasing Opportunity for All. Is the digital divide placing your workforce in danger of falling behind? According to recent studies, less than 10 percent of working-class people have access to high-speed Internet service. Even worse, in a digital world where all levels of schools use the Internet extensively, children without access are at a major disadvantage. A muni wireless network can provide affordable—or even free—broadband access for every family and individual, helping to level the playing field and enhance both lifestyles and short- and long-range opportunity.

The Motorola/ Earthlink Connection

EarthLink, one of the nation's premier Internet Service Providers, has selected Motorola to be the equipment and services provider, system designer and system integrator for its first five major municipal broadband network deployments. "We did an extensive evaluation process that led to the selection of Canopy®," says Bill Tolpegin, vice president of development and planning at EarthLink. "We've seen how Canopy works in the field, and we like it." The EarthLink/Motorola team has quickly emerged as the "go to" muni wireless broadband provider, and has already been selected as the network operator for citywide networks by municipalities in Philadelphia (see sidebar) and Anaheim, California."

The Revolution: When, not If

For years, you've been hearing about how the extraordinary benefits of a totally connected community will be available soon. Today, municipal wireless broadband networks are changing "soon" to "now." Many municipalities of all sizes have begun to look at the providing of broadband access as a basic municipal service, similar to electricity and trash collection. That's a revolutionary new way of thinking about communications.

Why Now?

Why are things moving so quickly now? In essence, the emergence of three interrelated drivers has sped up the process. The first is the availability of unregulated spectrum, relieving providers of the albatross of having to spend millions of dollars to secure a portion of spectrum. The second is the arrival of a new generation of powerful yet affordable wireless devices. Finally, the last few years have seen the introduction of low cost broadband infrastructure equipment that delivers significantly improved security and quality. With costs down and efficiencies up, muni wireless networks have become not only viable, but virtually inevitable.

A Global Trend

In the United States alone, approximately 300 cities and municipalities are currently exploring or experimenting with Metro WiFi networks. A few dozen of these, led by cities such as Philadelphia, Milwaukee and Anaheim, are planning and beginning to implement full-scale networks. Other cities, including Minneapolis, San Francisco, New Haven and Portland, Oregon, have sent out RFPs for substantial municipal wireless network projects. Similar growth is happening on a global basis.

In terms of dollars, a recent state-of-the-market report estimates that U.S. Metro WiFi spending exceeded $76 million in 2005. This amounted to a 142 percent increase over 2004 spending. Estimates for 2006 project continued double- or triple-digit growth in the U.S., with the market predicted to exceed $177 million by year's end. Longer-term estimates project the 2007 market to exceed $405 million.

Worldwide Metro WiFi markets are predicted to have similar growth rates, with 2006 EU projections at approximately $19 million, and Asian markets at about $62 million. More importantly, estimates for 2008 jump to $164 million in Europe and $273 million in Asia.

Community vs. Community

Today, municipalities of all sizes are discovering that competition isn't merely a business phenomenon. As more and more companies and small businesses open, expand and relocate, they are weighing their location and re-location opportunities carefully. The same is true for private residents moving into or relocating to a specific geographic area. Cities and communities that are implementing or planning a municipal wireless broadband network offer a compelling competitive advantage that enhances their images, and is proving to attract both new residents and new businesses. The result is ongoing economic development that will help ensure escalating community prosperity in the years to come.

For communities committed to ongoing social and economic growth, it's not so much a question of *if* you need a municipal wireless network. It's a question of *when*. And with Motorola Mesh Solutions, the answer is *now*.

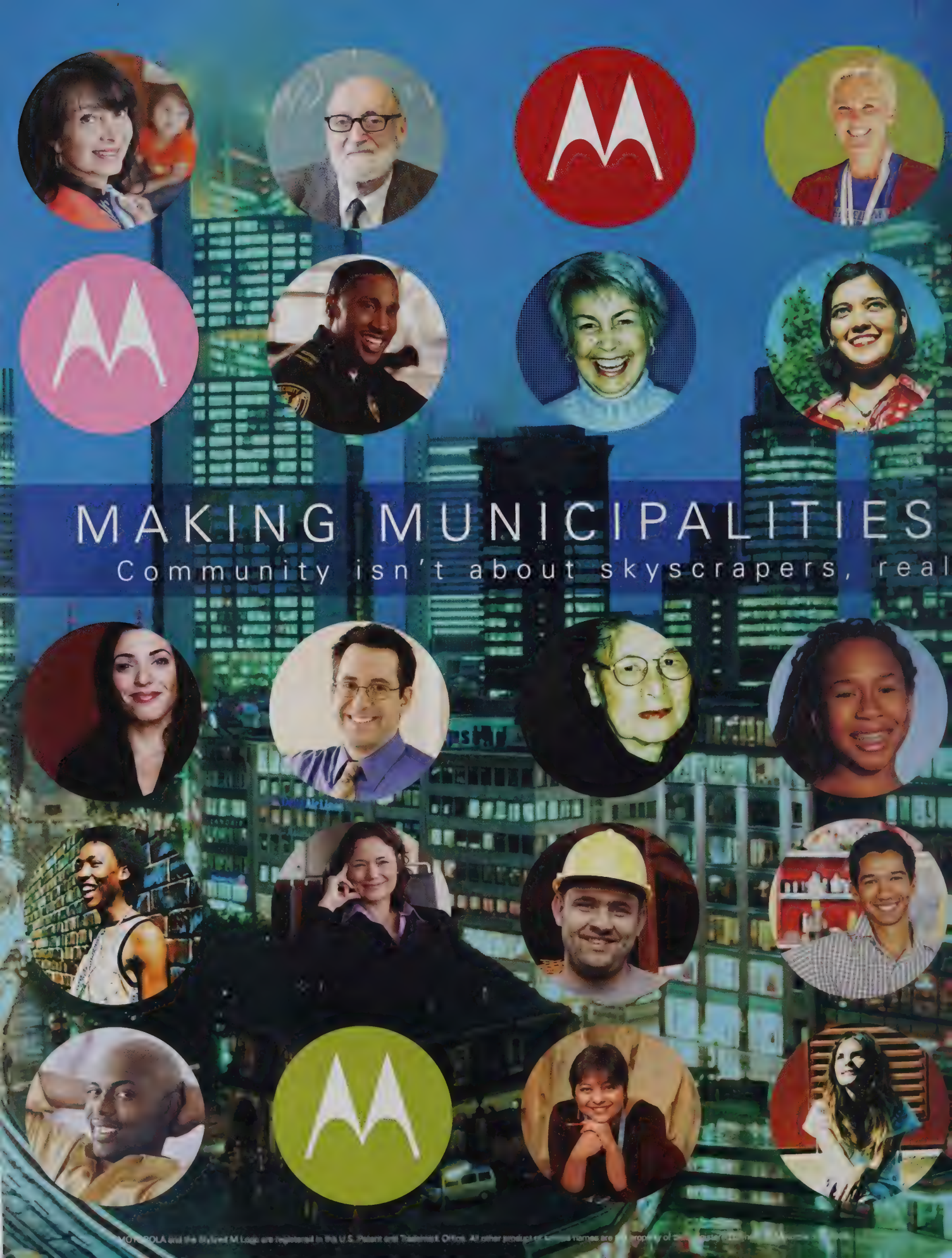
Alternate Deployment Models

Today's municipalities have a number of options when it comes to making the best business case for muni wireless. These include four major deployment model alternatives:

- **Municipal Owned/Private Use.** The network functions as an extension of the municipality's network; it is installed and operated by an integrator.
- **Municipal Owned/Mixed Use.** The municipality acts as an ISP (Internet Service Provider) for public access. The network is installed and operated either by the municipality or an integrator.
- **Utility Partnership.** The network is owned by the municipality and operated by the service provider, which leases capacity from the municipality.
- **Service Provider Owned and Operated.** Through a franchise agreement, the service provider delivers low cost or no cost capacity for municipal public services. The network supports multiple ISPs in a wholesale model that can become a significant revenue generator for the municipality.

Creating Community

What makes a city or a town a community? Wireless broadband connectivity can help create a new sense of belonging and a greater sense of identity as a member of a true community of peers that provides everyone with service, support, stimulation and opportunity for advancement both economically and socially.



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COMMUNITIES...THIS YEAR
estate or Main Street. It's about people.
Let Motorola Mesh Solutions help you turn your municipality into a true community by connecting people at home, at work and on the go.
MOTOWi4

The Revolution: Now

Motorola is an acknowledged global leader in wireless communications. Our overarching vision is a world with true seamless mobility, with all technology and services centered on the user, rather than the network or device. Motorola is advancing this vision by providing the industry's only total municipal wireless solution.

All-Inclusive Solution

Recognizing that the needs of all metropolitan areas are not the same, Motorola offers a broad portfolio of mesh technology that fits very different municipal requirements. We offer everything needed to implement a cutting edge municipal wireless broadband network from planning, to design, to implementation and network management. As an integral part of our MOTOwi4™ portfolio of advanced products (see sidebar), Motorola Mesh Solutions consist of three interrelated, complementary products that offer cost-effective equipment, rapid deployment and fast ROI.

- Motorola's MOTOMESH™ Multi-Radio Broadband Solution, whose architecture supports up to four radio networks in a single access point, enables complete municipal-wide wireless connectivity. By combining radios in the unlicensed 2.4 GHz and the newly licensed 4.9 GHz public safety spectrum in a single network architecture, MOTOMESH allows municipalities to provide municipal WiFi access to the public, license-free mobile broadband to public works and dedicated licensed, network connectivity and security to public safety over a single network.
- Motorola's Mesh Enabled Architecture (MEA®) technology, originally developed for the military battlefield, is a private mobile broadband solution that delivers desktop applications into the field at highway speeds. The MEA network features Motorola's unique Multi-Hopping® capabilities turning each mesh-enabled radio into a router/repeater. As a result, every user makes the network stronger. Fast and accurate tracking capabilities without the use of GPS satellites are also an inherent feature of the MEA system.
- Canopy® HotZone* is a dedicated solution for communities concerned primarily with improving public Internet access and eliminating the digital divide. Combining unlicensed standards-based WiFi radios and Canopy system backhaul to support the cost-effective deployment of wide area broadband wireless, HotZone solutions offer remarkably efficient and cost-effective public access capabilities.

Canopy Technology

Motorola's Canopy wireless broadband technology interconnects all of Motorola's Mesh Solutions. The Canopy platform is a robust, high-speed wireless solution that gets people to the Internet by delivering IP connectivity to mesh networks. It is a scalable, reliable platform that supports high-speed broadband applications and offers one of the lowest total costs of network ownership. Canopy point-to-point and point-to-multipoint system configurations and leading edge backhaul technology are proven in more than 100 countries around the world.

Breakthrough Applications

Motorola Mesh Solutions enable and deliver a growing number of breakthrough applications that help you increase productivity and reduce

Connecting the Unconnected: The MOTOwi4 Platform

Motorola has been a global leader and innovator in wireless technology for over 75 years. Our expertise at "connecting the unconnected" has literally been proven all around the world. MOTOwi4 is a portfolio of Motorola's next generation IP solutions for fixed and portable broadband access that makes the Internet and information more accessible. We've connected schoolchildren in Macedonia, remote medical facilities in Mexico, communities in the U.S., Italy, and Spain, people in more than 100 countries around the globe. Products include: the MOTOMESH Multi-Radio Broadband Solution; the Canopy wireless broadband access platform; Canopy HotZone; and Motorola's WiMAX portfolio

* Powered by Tropos MetroMesh

cost in three crucial areas of municipal life: public safety, public works, and public access.

Applications that help police, fire and emergency services personnel improve public safety include mobile broadband, video surveillance and incident hotspots. Public works efficiency is improved through applications such as mobile broadband, meter reading, school and library connectivity, and much more. Municipal wireless broadband applications also improve public access for business and consumers, making it possible to eliminate the digital divide by providing high-speed connectivity for every community member.

In the near future, an explosion of applications—such as VoIP, video surveillance, location-based services, music and mobile gaming—will help your community gain even more flexibility and productivity from your wireless broadband network.

> "Muni wireless networks increase productivity and reduce cost in public safety, public works and public access."

True Community

A MOTOwi4 network can bring your municipality into the future faster than just about anything else you can do. With high-speed wireless connectivity, you can improve public services, speed economic development, reduce budgets and enhance the lifestyles of virtually every individual, family and business. You can turn your municipality into a true community. Because Motorola has been a global municipal wireless communications leader since 1930, you can move into muni wireless with confidence. And because MOTOwi4 products are available right now, your municipality can become a stronger, more connected, more livable community this year.

The Philadephia Story

Motorola is playing a major role in the important Wireless Philadelphia Metro WiFi initiative, providing MOTOwi4 equipment, as well as installation, integration and support services for networks owned and operated by EarthLink. Here is an overview of this project based on an interview with Dianah Neff, CIO of the City of Philadelphia.

A discussion with Mayor Street on how to continue to spur economic development in Philadelphia neighborhoods led CIO to look at using transformational technologies like wireless. Philadelphia does have a digital divide issue, and we also wanted to help families with children, especially low-income families with children in our public schools. We decided on a wireless broadband network to bring affordable access to all neighborhoods.

Following an RFP selection process, we chose to build an open access network with our private sector business partner, EarthLink, who is putting up the money to build the network. They are building the infrastructure with Motorola. Motorola is the subcontractor that will be doing the roll out, design, implementation and support.

For the complete interview with Dianah Neff, please see the e-zine Connections, at www.connectwithcanopy.com.

Proving the Concept

Case Study #1: Riviera Beach, Florida

In 2005, the Police Department of the City of Riviera Beach, Florida was able to utilize seized drug money to take the plunge into municipal wireless broadband. With the funds, the Department purchased Motorola's MOTOMESH multi-radio solution. The system addresses the needs of public safety, public works and public access in a single network by leveraging multiple radios in both the licensed 4.9 GHz band and the unlicensed 2.4 GHz frequency bands.

The city's new MOTOMESH network offers broadband connections and the ability to support the mission critical data and video needs of officers in the field. For example, the system allows officers to monitor high quality video feeds from cameras placed in heavy traffic and high crime areas. In addition, officers now have mobile broadband access to county criminal justice databases, Amber Alerts and the county mug shot and fingerprint system. The MOTOMESH network also allows all Riviera Beach first responders to better prepare for and react to hurricanes and other disasters.

"By delivering state-of-the-art applications into the field, officers have the resources they need to proactively reduce crime and serve the Riviera Beach community," said Chief of Police Clarence Williams. "With MOTOMESH we have the ability to expand the network to bring on other municipal agencies as well as provide residents, businesses and tourists with wireless Internet access in the future. This flexibility allows us to more efficiently address the needs of our citizens while staying within our budget."

Case Study #2: Tulsa, Oklahoma

With wireless broadband equipment coming of age, and the ability to architect mesh networks, Tulsa MetroNet was launched—with private funds—to build a Metro WiFi network to serve the Tulsa metro area. Instead of teaming up with the city government as many of the nation's Metro WiFi providers have done, Tulsa MetroNet decided to go it alone. By remaining autonomous, the ISP felt it could get to market faster, as well as avoid potential legal issues.

In August, Tulsa MetroNet launched its beta test network, which covers an area of about seven square miles. About 250 people registered for service before the beta test. Fifty of them were initially chosen to go live on the network. Currently, the company is delivering limited commercial service to nearly 500 user accounts belonging to business and residential customers. "The beta test is proving that an ISP using a WiFi mesh network connected to a Motorola Canopy-based wireless backhaul network can be profitable," says Trevor Langham, CEO of Tulsa MetroNet. He expects the company to have more than 2,000 customers shortly.

Still in the first phase of a planned four-phase build-out, the network will provide coverage across 72 square miles when it is complete. The company will evaluate expansion into the suburbs at that time.

For more information about how Motorola's expertise and MOTOwi4 portfolio of wireless broadband products can help your municipality take advantage of a powerful but cost-effective Motorola Mesh Solutions network, call us at **1.800.795.1530** or **1.866.515.5825** or visit us on the Web at **www.motorola.com/canopy/meshsolutions**

MOTOwi4

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munitechnology.

Behind the boom in mesh networks

by Eric Hellweg

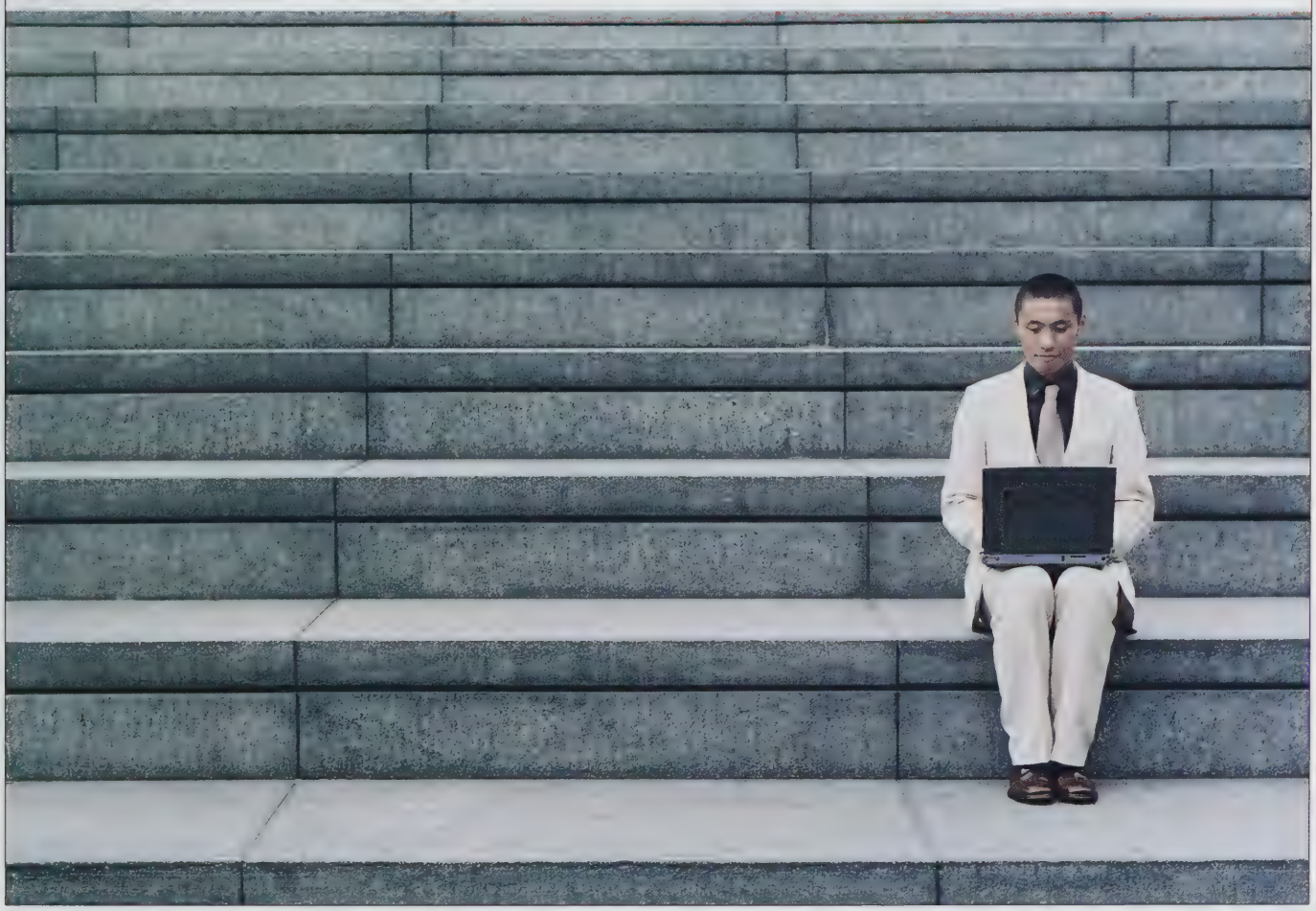


PHOTO FROM VEER

When it comes to designing the floorboards on which your public broadband initiative will stand, you wouldn't necessarily want to rely on something called a "mesh." But mesh networking is rapidly becoming the design of choice for many wide-area wireless networks, so if you're involved in planning muniwireless projects it's important to understand the basics.

Mesh networks are a relatively new technology solution that is attractive to municipalities because of their relatively low cost, ease of expandability and support of mobile applications. They differ from traditional wireless networks, which operate in a "hub and spoke" scheme. In the hub and spoke model, computers and other devices all communicate directly to one access point, or node, which, in turn, has a wired connection to the Internet.

By contrast, a mesh network has a number of nodes scattered about an area. Each node's coverage area overlaps at least two other nodes' signals. All of the nodes continuously

talk to one another, and eventually relay information from a computer or other device back to a base hub that's connected to a wired Internet link. That allows mesh networks to be "self-healing." If one or more nodes stops working, the others continue relaying data without missing a beat.

"Mesh is quickly becoming the preferred form," says Sascha Meinrath, project coordinator for Champaign-Urbana Community Wireless Network (CUWiN), a group that assists communities in setting up open source wireless networks.

The hub and spoke model prevailed until around 2004. "But since then, there's been more research and development in mesh, and it's been shown to be more stable," Meinrath says.

Making Mesh

Mesh networks can cost less than traditional hub and spoke wireless networks because you don't have to add a new Internet-connected hub every time you extend the coverage of your network. Instead, mesh networks grow when more nodes are added, increasing capacity and performance.

A new node automatically checks around, finds other nodes and immediately is able to let people begin accessing the network. That also allows mesh networks to cover greater distances, since most nodes act as repeaters to pass along signals from one to the next until a wired Internet connection is found.

Mesh networks work very well if your municipality has mobility applications in mind. Richard Bull, chief of police for Ripon, Calif., had used an 802.11 network for some municipal tasks. But in 2005 the city launched a mesh network, in part because the police department wanted to install wireless laptops in its police cruisers. The officers could view live video streams from surveillance cameras, and could also send video footage from the cruiser back to the station.

"Standard WiFi networks wouldn't work with a cruiser in motion," Bull says.

Oklahoma City, Okla., was an early adopter. "Mesh was just on the horizon when [our] decision was made," says Mark Meier, the city's director of IT. "Other cities will benefit from our efforts, because we had hundreds of technical problems that were overcome in the process."

Oklahoma City moved from an existing Cisco network that used a traditional hub and spoke approach. Being a pioneer was worth it: "I didn't want any hot spots," Meier says. "I wanted contiguous connections. I wanted mobility factored in." Oklahoma City now uses a Tropos mesh network that gives it the coverage it needed.

Mesh networks are especially good at supporting workers who are in the field a great deal, such as fire department, police and public works. But if your municipality doesn't have mobility needs, or isn't initially focused on the applications that support these workers, then mesh networks may be overkill.

Money for Mesh

Costs for mesh networks vary with each installation. Municipalities need to calculate the number of nodes that will be needed to provide the kind of coverage and performance they want in their target areas. They also need to decide on using 2.4 GHz spectrum—crowded and unlicensed, but unrestricted—or the more recently added 4.9 GHz spectrum, which is intended only for safety-related initiatives. And they need to determine their growth needs over time, to ensure that the network will continue to support needed services as it expands.

Growing the network, though, means more work to configure and manage all those nodes. Some municipalities with crack IT staffs have decided to manage their own mesh networks, especially if they're on a smaller scale. But those who feel their efforts are better spent elsewhere will want to explore different outsourcing and maintenance arrangements. IBM, EarthLink, Sprint, Tropos, Motorola and Lockheed Martin all offer mesh network management options.

In Wake County, N.C, John Higgins, assistant director of technical infrastructure, didn't want to have to purchase equipment

and manage billing and support, so he outsourced his municipal wireless network to Sprint. Applications on the network include public safety, fire, emergency services and more mundane communications functions between city and county offices.

Pasadena, Calif., is also considering such an approach. Currently soliciting responses to its RFP, the city is looking for a vendor to build, install and maintain a muniwireless network. In exchange, the city will pay a regular monthly fee to access the network, and the company will get the right to sell wireless access to Pasadena's citizens.

"We had such a variety of needs and we wanted to offer public access, so the kind of network we needed was expensive to undertake on our own," says Lori Sandoval, IT planning and project manager for Pasadena. "We looked at other options, but decided to go the private sector route, with the private sector funding the network."

Small areas don't necessarily mean small costs, however. Ripon spent roughly $600,000 to cover just seven square miles with a mesh network from Motorola. That includes 50 mesh routers, 52 mobile modem units in police cruisers and other city vehicles, and a three-year maintenance contract with outsourcer Lockheed Martin.

A growing number of vendors now offer mesh network equipment. Companies such as Tropos and Motorola have been in the market for some time, while Cisco and Nortel are more recent converts. And local consultants and integrators are becoming more mesh-savvy, as public wireless initiatives sprout around the country. Still, though many municipalities are considering wide-area mesh networks that are truly breathtaking in scope, few actual large-scale initiatives have been deployed.

If cost is a paramount concern, and your city IT staff is up to the task, you may also want to consider open source mesh networks. These are networks that don't rely on proprietary software or technology, instead using software that's available for free. Open source alternatives are an order of magnitude cheaper than off-the-shelf options. Instead of roughly $1,500 to $3,000 per node, it's around $150 to $300.

"As municipal tech people become more savvy, they'll look at open source and realize they could save 80 percent going open source," says Meinrath of CUWiN.

But don't underestimate the amount of time and work that such networks can take, and make sure you have the technical expertise to tackle such an approach.

Plan Your Mesh

Part of any planning process for a mesh network involves determining who will be using the network. General public use means unlicensed spectrum in the 2.4-GHz range. But if your network will be used primarily for first-response and public safety applications, you'll want to consider the 4.9-GHz spectrum, reserved solely for such uses. Public safety applications can also run in the 2.4-GHz band, but you'll want to be sure they carry extra security, such as encryption from one end of a connection to the other.

"Public safety officials have a need to deploy mission critical and DHS applications that are secure, dedicated and accessible at vehicular speeds," says Rick Rotondo, director of marketing in Motorola's Mesh Networking Group.

If your municipality wants to offer public access as well as public safety applications, consider products that support both 2.4 and 4.9 GHz.

No matter what applications you're considering, it's essential to build a solid mesh networking plan. Especially if your area has any anomalies—a complex topography, or even a complicated political environment—consider a feasibility study by a knowledgeable consultant before tackling the RFP process. You'll want to know where the major headaches may crop up before you install too many mesh nodes.

With the right analysis, a clear idea of the kinds of services you want to provide, and a solid plan, you'll make sure that all of your needs will, of course, mesh. MW

VENDOR DIRECTORY

Wireless Mesh Equipment

BelAir Networks: www.belairnetworks.com

Cisco: www.cisco.com

Firetide: www.firetide.com

LocustWorld: www.locustworld.com

MeshDynamics: www.meshdynamics.com

Motorola: www.motorola.com

Nortel Networks: www.nortelnetworks.com

PacketHop: www.packethop.com

RoamAD: www.roamad.com

Sensoria: www.sensoria.com

SkyPilot: www.skypilot.com

Strix Systems: www.strixsystems.com

Tropos Networks: www.tropos.com

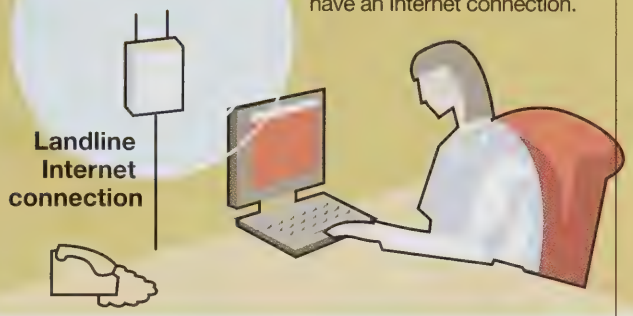
Source: MuniWireless State of the Market Report, 2005, www.muniwireless.com

TERESANNE RUSSELL

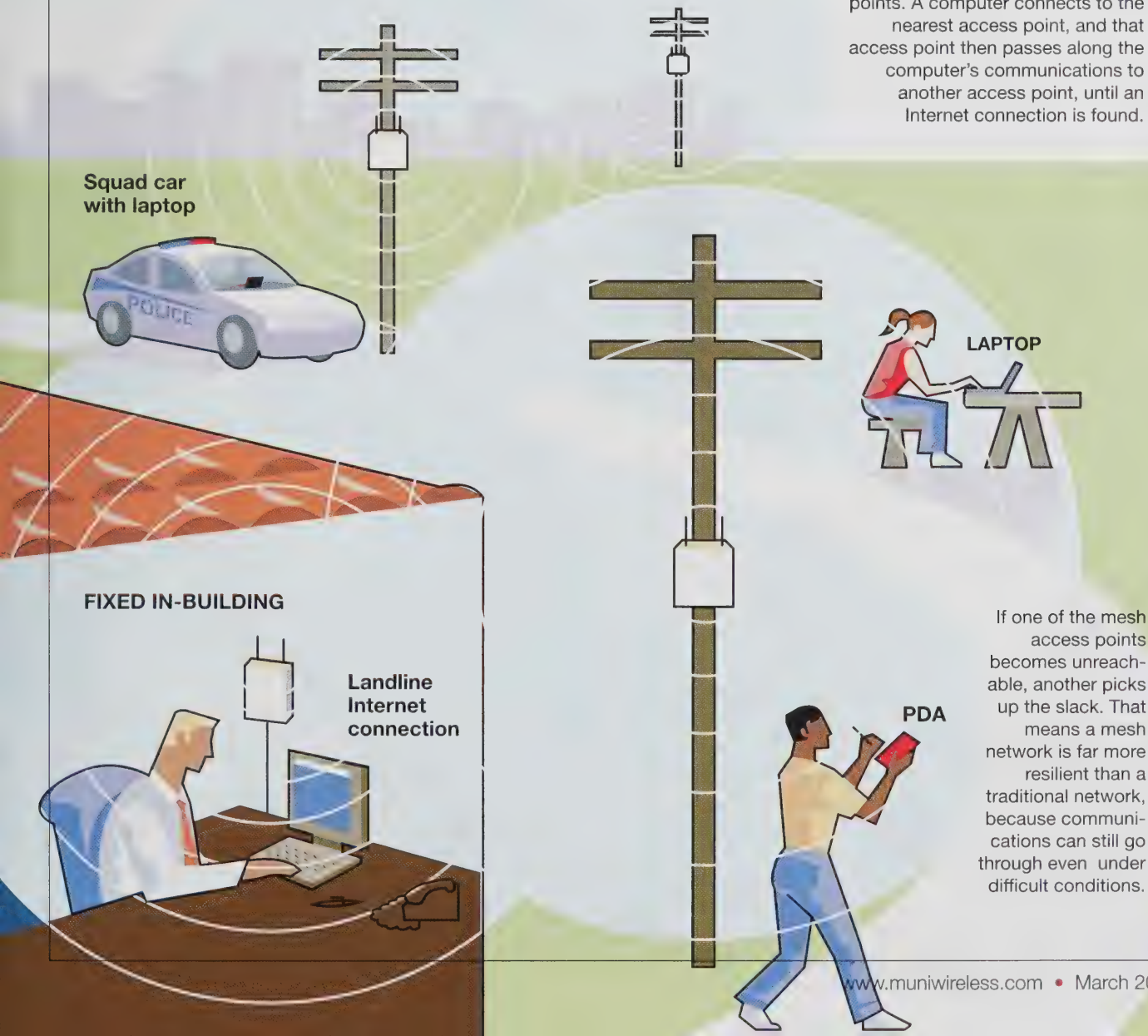
HOW IT WORKS:

traditional vs. mesh networks

TRADITIONAL WIFI NETWORKS allow a computer to talk to one access point, and that access point has to have an Internet connection.



MESH NETWORKS create a wireless fabric, or mesh, of access points. A computer connects to the nearest access point, and that access point then passes along the computer's communications to another access point, until an Internet connection is found.



If one of the mesh access points becomes unreachable, another picks up the slack. That means a mesh network is far more resilient than a traditional network, because communications can still go through even under difficult conditions.

phoenix.

Taking a step-by-step approach to muniwireless by Mike Perkowski

A FEW FACTS ABOUT PHOENIX, ARIZONA:

In a little more than two generations—from 1950 to today—Phoenix has grown from the 99th largest city in the United States to the fifth largest, with a population of 1.5 million, spread across more than 500 square miles.

During the five-year period from 2000 through 2004, Phoenix averaged 8,664 new residential dwelling units per year, with an aggregate population growth of 91,921 residents, putting it behind only New York City as the fastest-growing population in the country. The housing boom of 2005 saw Phoenix permit 14,144 new residential units.

Phoenix Sky Harbor International Airport, which the city owns and operates, is the fifth-busiest airport in the world, with 1,500 takeoff and landing flights every day. The airport had a $26 billion economic impact last year, employing 31,000 people, primarily through private businesses operating there.

Fast-growing; dynamic; innovative; a technology center; a sprawling, relatively flat terrain: Phoenix would seem to be a prime candidate for municipal wireless.

Is it?

In theory, yes, according to Mayor Phil Gordon.

"Municipal wireless no longer is a luxury—it's fast becoming a necessity," Gordon says. "If you're going to compete in the knowledge economy for new businesses and residents, you have to do things like this to make your community a more attractive place to work, live and visit."

In reality, however, Phoenix isn't much of a threat to knock Philadelphia or San Francisco out of the muniwireless spotlight.

Instead, Phoenix's approach to muniwireless has been one step at a time, a strategy similar to three of the cities that rank above it in size in the United States: New York, Los Angeles and Chicago. Among the top five largest U.S. cities, only Houston has announced it will issue an RFP.

Here's where Phoenix stands:

- Two muniwireless projects up and running in the library system and airport
- Two additional projects that would bring muniwireless to the downtown area
- A vision from city leaders that would support free wireless in all city facilities.

Phoenix has tested the muniwireless waters in a few strategic areas. So far, the pilot projects have been successful and the city plans to keep wading in a bit deeper, albeit slowly. Why the cautious approach? Well, the local mandate is to promote business development by keeping taxes in check: After all, Arizona is a state that has cut its corporate income tax rate three times since 1997.

Phoenix took its first baby step into municipal wireless a year ago, when it implemented WiFi in its 14-branch public library system. At first, wireless access was limited to the library's own notebook computers available for free public use on an hourly metered basis. In most of the branches access remains limited. However, three branches now have free hotspots that residents can use with their own notebooks or PDAs.

The city followed up by rolling out free public WiFi at Sky Harbor International Airport. The service, based on Cisco Systems Inc.'s wireless infrastructure and implemented by Sky Harbor's own Technology Division, went live in December, 2005. It operates at 6 Mbits per second through all airport terminals on both sides of the security gates. Sky Harbor says more than 108,000 passengers depart or land at Sky Harbor daily. Offering free WiFi at Sky Harbor, as well as at other city facilities, "is an easy decision," according to Kristine Sigfridson acting chief information officer for the city.

"If you're doing business with a city-owned facility, wireless access should be available and it should be free," Sigfridson says.

But Phoenix has no desire to own and operate its own WiFi network.

"We don't want to compete with the private sector," Sigfridson says. "We'd much rather partner with them."

City officials say the library and airport projects deliver the dual benefits of improving constituent service and acting as a real-world "municipal WiFi learning lab." But the linchpin of Phoenix's municipal WiFi strategy will be the downtown area, where two different initiatives will roll out this year—one primarily for municipal applications, the other focused more on public access. They are:

- A test by the Street Transportation Department to tie wireless monitoring to its existing hard-wired management systems.
- A project to provide free wireless to businesses, residents and visitors in a 90-square block downtown area known as Copper Square.

The goal of the Street Transportation initiative is to determine how wireless networks can more efficiently manage traffic flow in the heart of town. It starts as a $150,000 pilot project based on Cisco wireless infrastructure. The pilot will provide wireless monitoring of 10 downtown intersections to control traffic-light sequencing and provide live video feeds to the department's host system at City Hall.

"We've got a fiber backbone, but it's impossible to cost-effectively connect all the traffic controls that way," says Bob Steele, who manages the city's Intelligent Transportation System project. "Wireless can be a better way to do that, especially if we can reliably feed live video back to the host system."

The city issued its RFP for the pilot last fall and recently awarded the contract to Tempe, Ariz.-based Calence LLC. John Howard, Calence's director of network infrastructure

MuniWireless

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Title_____ Business/Municipality_____
Phone Number_____ Fax _____
Business Address _____
City _____State/Province _____
Zip/Postal Code_____ Country _____

1. What is the primary activity of your organization? (select one only)
- ☐ 01 Municipal Government (Town, City, County, or other local or regional)
- ☐ 01 State Government
- ☐ 02 Federal Government
- ☐ 03 Telecommunications Service Provider
- ☐ 04 Internet Service Provider
- ☐ 05 Wireless Internet Service Provider
- ☐ 06 Value-Added Reseller/Systems Integrator
- ☐ 07 Hardware/Software Manufacturer
- ☐ 08 Consultant
- ☐ 09 Education
- ☐ 10 Media
- ☐ 11 Investment/Financial
- ☐ 12 Lobbyist
- ☐ 13 Community Advocate
- ☐ 14 Other (please specify)_____
- ☐ 15 None of the above

2. What is your primary job function? (select one only)

IT
- ☐ 16 CIO, CTO, CSO
- ☐ 18 VP/EVP/Director of IS
- ☐ 19 Network Manager, Telecommunications Manager
- ☐ 21 Engineering Manager
- ☐ 22 Other Information Technology Management
- ☐ 23 Information Technology Staff

Government
- ☐ 24 Elected Official (Mayor, Council Member, e.g.)
- ☐ 25 Non-Elected Official (Police/Fire Chief, Building Inspector, e.g.)
- ☐ 26 State/Local Regulator
- ☐ 27 Federal Regulator

Business
- ☐ 28 Chairman, CEO, President, Owner, Principal Partner
- ☐ 29 Controller, Treasurer, CFO
- ☐ 30 Vice President, General Manager
- ☐ 31 Technical, Engineering
- ☐ 32 Marketing, Sales
- ☐ 33 Other Business

Influencers
- ☐ 34 Consultant
- ☐ 35 Analyst/Financial Investor
- ☐ 36 Journalist

☐ 37 **Other** (please specify)_____

3. If you are with a municipality, what is the status of your municipality's broadband wireless network? (select one only)
- ☐ 38 Already up and running
- ☐ 39 Plan to install within the next year
- ☐ 40 Plan to install within two years
- ☐ 41 Plan to install with no time frame
- ☐ 42 Thinking about it, but no specific plan to install
- ☐ 43 Other (please specify)_____

4. What is the approximate population of the community the network serves/will serve? (select one only)
- ☐ 44 More than 1 million people
- ☐ 45 500,000 to 1 million
- ☐ 46 250,000 to 499,999
- ☐ 47 100,000 to 249,999
- ☐ 48 50,000 to 99,999
- ☐ 49 25,000 to 49,999
- ☐ 50 10,000 to 24,999
- ☐ 51 Less than 10,000

5. What technologies/platforms/services are you using and/or considering for your municipal broadband network implementation? (select all that apply)

	Using	Considering
☐ 52 Mesh Networks	A ☐	B ☐
☐ 53 WiMax	A ☐	B ☐
☐ 54 Security Products	A ☐	B ☐
☐ 55 Customer Premises Equipment	A ☐	B ☐
☐ 56 Back Office Equipment	A ☐	B ☐
☐ 57 Consulting Services	A ☐	B ☐

☐ 58 Other (please specify)_____

6. What applications are you using and/or considering for your municipal broadband network? (select all that apply)
- ☐ 59 Public Safety
- ☐ 60 Education/Training
- ☐ 61 Asset Tracking/SCADA (Supervisory Control + Data Acquisition)
- ☐ 62 Building Inspection
- ☐ 63 Utilities/Public Works
- ☐ 64 Hospitality/Visitor Services
- ☐ 65 Residential Public Access
- ☐ 66 Business Public Access
- ☐ 67 Homeland Security
- ☐ 68 Disaster Recovery
- ☐ 69 Other (please specify)_____

7. Approximately how much is your municipality planning on spending for municipal wireless networks in the next 12 months? (select one only)
- ☐ 70 less than $10,000
- ☐ 71 $10,000 to $24,999
- ☐ 72 $25,000 to $99,999
- ☐ 73 $100,000 to $499,999
- ☐ 74 $500,000 to $999,999
- ☐ 75 $1 million to $2.499,999 million
- ☐ 76 $2.5 million to $499,999 million
- ☐ 77 $5 million or more
- ☐ 78 None of the above

8. What is the scope of your purchase authority for your installed or planned municipal broadband networks? (select all that apply)
- ☐ 79 Approve purchases
- ☐ 80 Approve vendors
- ☐ 81 Evaluate vendors
- ☐ 82 Prepare/write RFPs
- ☐ 83 Recommend requirements
- ☐ 84 Recommend vendors
- ☐ 85 None of the above

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- ☐ 87 Information on attending a MuniWireless conference or Web Seminar
- ☐ 88 Information on attending a MuniWireless seminar or roundtable
- ☐ 89 Information from a MuniWireless partner
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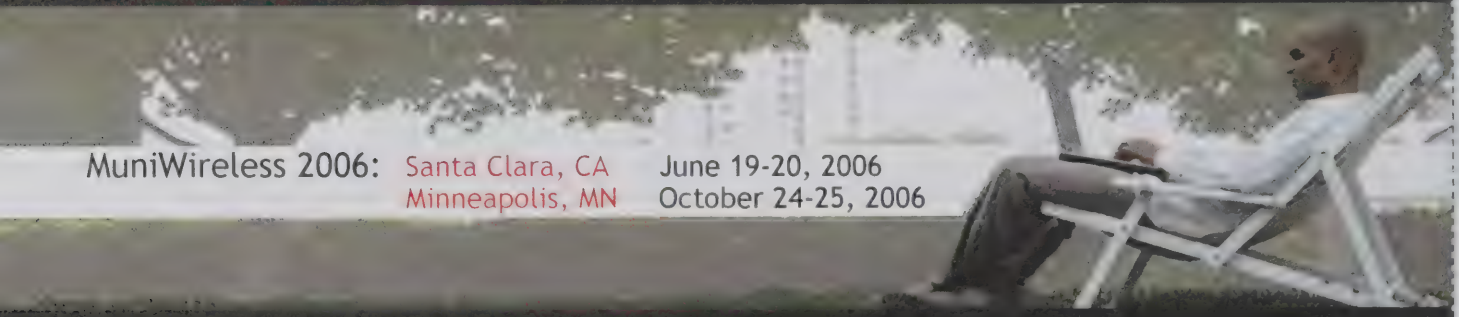

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Phoenix mayor Mayor Phil Gordon (left) and Kristine Sigfridson, acting chief information officer.

solutions, says work is expected to begin in March or April, with the system operational by June.

Although specific metrics for evaluating the pilot still are being formulated, Steele says the goals are clear: "Reduce accidents, cut wait times at high-traffic periods, and reduce congestion."

While the city's municipal proof-of-concept may seem modest, if the transportation project proves successful officials envision a wide-ranging expansion. Steele says a successful pilot could lead to two follow-on phases. The first would provide for broader geographic deployment of the traffic-management project, while the second would potentially encompass the entire city. Steele estimates that expansion could represent a seven-figure deployment, perhaps two years out, and would incorporate additional city services such as public safety and the city's water utility.

The other major wireless project under consideration is designed primarily to provide public access downtown. That project comes under the auspices of the Downtown Phoenix Partnership, a non-profit organization funded by the city and surrounding Maricopa County. The project—which includes City Hall, major city and county facilities and private businesses—is critical to the city's efforts to drive new development to the downtown area.

Rob Edwards, director of economic development for the Downtown Phoenix Partnership, says his group will soon issue an RFP that will act as a blueprint for the deployment of public WiFi to attract new development and activity to Copper Square and, eventually, the entire downtown Phoenix area.

An important factor in the eventual downtown WiFi rollout is Arizona State University's plan to expand from its home base in adjacent Tempe to Copper Square. ASU's commitment to provide free WiFi to students and staff was a key factor in the City of Tempe's decision to roll out municipal wireless last year. ASU's intention to develop additional campus housing in downtown Phoenix is a strong catalyst for the Copper Square project as well. In fact, the CIOs of Phoenix, Maricopa County and ASU are collaborating on the Downtown Phoenix Partnership to ensure that all three parties' needs are addressed in the eventual deployment. Edwards said the organization hopes to issue the RFP shortly, and have the initial phase of the deployment in place when ASU students come back to school for the fall 2006 semester.

Phoenix will present voters with various bond propositions in March, one of which would designate $900,000 in spending on "mobile worker and wireless access in city facilities." Wireless security is of paramount concern, with more than one-half of the proposed wireless spending going toward identity management to enable a robust authentication infrastructure.

The Phoenix Citizens' Bond Advisory Committee, which developed the technology recommendations report, also stressed that spending on wireless should be the highest priority if additional funds become available from the bond issue.

What does it mean?

How about this: Even in a city with a self-proclaimed conservative, take-it-slow approach, muniwireless will be available to millions of people this year through its airport, libraries and downtown initiatives.

Not a bad way to test the waters. MW

AN ADVERTISEMENT FOR MUNIWIRELESS.COM

Wireless Warrior

You've probably never heard of Esme Vos. But here's why your city officials may have.

By Jesse Drucker

Across the U.S., there's a battle raging over wireless Internet access. Telephone and cable companies are protesting efforts by local governments to set up citywide wireless networks, arguing the cities are competing unfairly against the companies' own high-speed networks. The struggle has played out in state legislatures across the nation, and now has even found its way to Congress.

So how did a lawyer living a continent away in Amsterdam become a key player in the fight?In 2003, Esme Vos, an intellectual-property attorney based in the Netherlands, became intrigued by the nascent U.S. municipal wireless movement. So she created MuniWireless.com as a clearinghouse for information on the cities' efforts.

Now the site—part bulletin board, part blog, part research database and part pulpit for tech evangelism—has become a crucial destination for city technology officials, journalists, bloggers and tech-heads looking for the latest developments on this fast-growing front.

Companies can find "requests for proposals" from cities seeking to set up wireless networks; cities can read about the problems other municipalities have faced with their wireless plans.

"She's like the dramaturge of the muni wireless movement," says Glenn Fleishman, editor of WiFiNetNews.com, a popular blog about wireless broadband. "As the debates are playing out, she's providing the information. I can't imagine a city or town doing research on this not turning to her site." He adds: "Essentially, she's been writing the briefs for these plans."

Indeed, Ms. Vos is an unabashed advocate of the municipal wireless efforts, arguing that the city-sponsored networks give consumers freedom of choice. "People now have choice other than the typical duopoly" of cable and telephone-company offerings, she says. "You'll start to see the European model happen here of lower prices and more bandwidth."

She equates high-speed Internet connectivity with other basic infrastructure. "Many municipalities think this is like electricity and water," Ms. Vos says. "You can't live in the world today and be productive and do research without broadband."

The 44-year-old Ms. Vos took an unusual path to high-tech advocacy. A native of the Philippines, she moved to the U.S. with her family after graduating from high school. She earned bachelor's and master's degrees in chemistry at the University of California—Santa Cruz and Los Angeles, respectively—and went on to Harvard Law School. After six years as a securities and intellectual-property lawyer for the likes of Microsoft Corp. and Novell Inc., she moved to Amsterdam in 1994 and worked for European tech companies.

Ms. Vos's interest in municipal wireless plans was sparked in 2003. She had recently worked for a company that maintained a directory of Wi-Fi hot spots—places where people can connect to the Internet wirelessly. When talking to a friend about how cities were creating hot zones across the U.S. and elsewhere, she realized that nobody was tracking the trend. Ms. Vos set out to do the job herself. The U.S., in her view, was far behind Europe in terms of broadband access; the idea of watching the nation catch up fascinated her.

So she set up MuniWireless.com and filled it with information mostly gleaned from Google searches. In February 2004, she started the MuniWireless email newsletter—sending it out to municipal officials, tech vendors, journalists and others—and a few months later she started selling the first advertising for the site. (At the time, she largely earned a living from a Web site she operated with her husband that located and rated bed-and-breakfasts. Now she draws part of her income from MuniWireless's ad sales.)

While still relatively small, the site's unique-visitor numbers have roughly doubled in the past year, to between 400 and 500 per day. And many of those visitors are key players in municipal wireless networks. Ms. Vos says she receives several queries a week from municipal information-technology managers about the state of other networks, and even more questions from journalists.

"I usually visit it once or twice a week," says Tony Tull, municipal information-technology director for Granbury, Texas, which recently deployed a citywide wireless network to serve its population of 6,400. "It keeps me abreast of other roadblocks that other people are seeing [from] the telco/cable company side, and it lets me see different models for how cities may be structuring their deals. Her site has really done a lot for the movement."

The movement began in small towns like Granbury and Scottsburg, Ind., that were tired of waiting for telecom providers to offer high-speed Internet service. Now more than 100 municipalities have deployed some form of wireless network to give their citizens low-cost or free access to the Internet. The movement includes some of the country's biggest cities, among them Philadelphia, San Francisco, Minneapolis and Chicago, which are seizing on the idea as a way to bridge the digital divide and spur economic development.

In many cases, the cities are contracting with telecom start-ups or Internet-service providers to run networks using Wi-Fi or other high-speed wireless technologies. That's bad news for traditional telephone and cable companies, since the municipal networks' wireless antennas bypass the "last mile"—the wired connections, controlled by cable and telecom firms, that run into people's homes and offices.

To protect their turf, telephone and cable companies are lobbying local legislatures and now Congress to restrict cities' wireless plans. In 2004, Pennsylvania enacted a law that requires cities to seek permission from local phone companies before offering paid telecom services; a much-publicized plan by Philadelphia for a citywide wireless network was grandfathered under the law. Last year, legislatures in at least 14 states and Congress proposed legislation to restrict municipal wireless efforts. And the governors of Colorado and Nebraska signed into law bills that restrict government telecom initiatives.

The project in Granbury was nearly killed last year when SBC Communications Inc.—since renamed AT&T Inc.—lobbied against projects like it in the Texas legislature. A proposed bill to quash such projects expired without a vote in June. Ms. Vos's site tracked the developments in the legislative battle.

Traditional telecom providers argue that cities shouldn't be in the business of providing or offering telecom services. It's unfair, they say, since cities can tap tax dollars to compete with private industry.

Ms. Vos dismisses that argument. "What they ignore is the telcos are getting subsidies" in the form of tax breaks and federal and state assistance for rural telephone service, she says. "Second, why shouldn't a city subsidize something? Roads are subsidized. A lot of infrastructure is subsidized."

Ms. Vos is sympathetic to the reality that many telecom providers haven't yet upgraded their infrastructure in places where they are less likely to turn a profit. "If I'm in the business of making money, why would I serve a poor neighborhood?" she says. "But don't stop somebody else from doing that."

Still, Ms. Vos's advocacy of municipal networks puts her on the same side as a different set of powerful industry players: equipment and chip companies like Intel Corp., Dell Inc. and Texas Instruments Inc., which gain from the sale of chips, wireless-enabled laptops and other products that use fast Internet networks.

ROSALIE SOLLAVELD

PLUGGED IN *Esme Vos, creator of the influential site MuniWireless.com*

Not surprisingly, Intel and Tropos Networks, a Wi-Fi equipment vendor based in Sunnyvale, Calif., have each contributed $35,000 to the site, Ms. Vos says. And Internet-service provider® EarthLink® Inc., which is increasingly relying on the wireless sector for growth, sponsored the opening night of a conference Ms. Vos organized recently in San Francisco. In attendance: about 320 people, largely officials from city governments and tech companies.

The site "plays a real valuable role in our industry," says Don Berryman, president of municipal networks for EarthLink, which is going to offer wireless broadband service in conjunction with local governments in Anaheim, Calif., and Philadelphia, and is bidding on city projects in San Francisco, Minneapolis, Milwaukee, Portland, Ore., and Denver. "This industry has evolved quicker than almost any industry I've seen, probably because of players like this."

Recently, Ms. Vos has joined with a start-up media company based in Garden City Park, N.Y., called Microcast Communications Inc. to set up MuniWireless LLC. As part of the venture, she wants to launch a quarterly magazine about wireless networks and organize more conferences. She also has started a business doing original research, quantifying the size of the municipal wireless market.

In the future, she sees wireless networks nearly everywhere, not just for Web access but for voice services as well. "It will shrink the traditional business model dramatically," she says. Traditional telecom companies, she argues, will be forced to form partnerships with Internet companies to offer next-generation services. "They'll have to change," she says.

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buckle up.

Muniwireless is here to stay

by Greg Richardson

From a handful of small communities and forward-thinking leaders, the muniwireless movement has spread to the largest and most complex cities in the United States. And the same themes that started it—economic development, digital inclusion and efficient government—are now being repeated in communities all around the world.

No longer can we refer to muniwireless as a grand experiment. A real market is taking shape, with all the characteristics of a market that can scale: Solutions with intrinsic value to a group of target customers; vendors that are motivated to invest capital and organized into a structured value-chain; viable business models that have been proven; technology innovation that can support new services; and a network of future buyers eager to learn from early successes and failures.

In addition to creating an exciting commercial market, muniwireless stands to have a dramatic and positive effect on the lives and livelihoods of people all around the world. At Civitium, I've been fortunate to be part of this market from its inception, and here are some of the things I'm seeing today that make it abundantly clear that muniwireless is on the verge of explosive growth.

Communities are moving beyond an initial emphasis on the network and are focusing more on applications and solutions. This has the effect of making the network's value more clear and sustainable.

Local governments are more aware and educated about the need to protect their rights and options. Tracking developments in state legislatures and telecom reform has become increasingly important for local government IT leaders. This has the effect of reducing or eliminating barriers to entry for all communities.

Business models have settled down into two main scenarios: Franchise-like arrangements where cities play the role of catalyst, set policy and form partnerships for the private financing and management of the network; and utility-like arrangements where cities play the role of provider, often with the political support to use public funds. This has the effect of lowering the risk for new communities and allowing a more predictable value-chain of providers to develop.

Service providers, VARs and systems integrators have matured their business plans, proposals and solutions. This has the effect of creating repeatability and shortening the procurement and/or partner selection process that communities must go through. New sources of private capital, new providers with new motivations and new experiments for how to monetize the return on the network investments all combine to have the effect of providing communities with options that didn't exist before—and marginalizing legacy providers who oppose the projects.

Technology innovation continues at a frantic pace; from second- and third-generation WiFi mesh systems, to the standardization of WiMAX, to smarter radio and antenna technologies. This has the effect of improving performance and reliability, while driving prices down.

And finally, the **vehicles for idea/information sharing** between communities have also grown and matured; from weblogs to conferences to events to newsletters. Who would have imagined two years ago that a *MuniWireless Magazine* would exist? This has the effect of creating an increasingly viral growth pattern as communities learn the best and worst practices from each other.

When you consider how the trends above work together to create increasing returns, it's easy to see why municipal and community wireless is here to stay. And why we should all buckle up. It promises to be a great ride. **MW**

GREG RICHARDSON IS THE FOUNDER AND MANAGING PARTNER FOR CIVITIUM, THE MARKET-LEADING MANAGEMENT AND TECHNOLOGY CONSULTING FIRM FOR MUNICIPAL GOVERNMENTS AND INSTITUTIONS THAT ARE APPLYING WIRELESS TECHNOLOGY AS THE FOUNDATION FOR DIGITAL COMMUNITIES. FOR MORE INFORMATION, VISIT WWW.CIVITIUM.COM OR E-MAIL GREG@CIVITIUM.COM

SCOTT LOWDEN

our broadband...

...and why we must protect it

by Jim Baller

In the past year, the massive groundswell of support for public broadband efforts throughout the U.S. has been both astonishing and gratifying. I've been helping communities develop their own advanced communications networks for nearly a decade and a half, and seeing so many towns, cities and counties rise up to take charge of their own broadband destinies is like a dream come true.

But unless we stay vigilant and act vigorously, the giant communications companies could well snuff out many of these local initiatives.

Think it's not possible? Think again.

I was reminded once more of the precarious nature of municipal broadband by a marvelous recent article, "Let There Be WiFi," by Robert McChesney and John Podesta, who suggest that broadband will be "the 21st Century equivalent of electricity" in powering world economies.

In the early 1900's, thousands of unserved and underserved communities across the country stepped forward to form their own electric utilities. McChesney and Podesta believe that municipalities today are well situated to play a similar role in deploying advanced fiber and wireless broadband networks, and I heartily agree. (For the full article: www.washingtonmonthly.com/features/2006/0601.podesta.html.)

I was gratified to find that the authors relied heavily on a paper I'd written about this back in 1994, one I'd almost forgotten. McChesney and Podesta reminded me that I had predicted that the major cable and telephone companies, like the electric companies a century ago, would grow into ungovernable giants, mounting massive campaigns against public communications initiatives. (The full paper is available at www.baller.com/library-art-history.html)

Unfortunately, my worst fears have come to pass. Since 1994, we have seen a wave of consolidations that has created a new generation of unmanageable behemoths, which have spared no effort and expense in bashing community broadband initiatives. Most frighteningly, we have now reached the stage at which these megaliths are beginning to claim the right to control the content we receive, by manipulating its availability through price and quality.

I wish I could say that not all incumbents see community broadband as a threat; that some see it as an opportunity to work shoulder-to-shoulder with the public sector to reverse America's shocking plunge in global broadband standing; or that even a single incumbent has seriously sought to partner with the public sector in a spirit of cooperation and mutual respect.

But I can't.

Up to now, the major incumbents have chosen to view community broadband as a threat to their profits, and have done everything possible to thwart these initiatives.

So, we must fight. We must visit, call and write to federal and state legislators. We must support municipalities in court and administrative litigation. And we must vigorously resist all anticompetitive incumbent practices.

Why? It's not just about enhancing economic development, promoting educational and occupational opportunity, ensuring public safety and homeland security, fostering digital equity, improving environmental protection, and adding to quality of life. These would certainly be enough. But there is more. Much more.

Simply put, at stake in the fight for community broadband is the very freedom and liberty we Americans take for granted. If we allow the incumbents to control not only the mass media, but also our own ability to send and receive information of our choosing, we jeopardize the democracy that is fundamental to American life. That's a fight that we can't afford to lose. MW

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If you were opening a business, wouldn't you want to locate in a totally connected community? A Motorola Mesh Solutions network can help your community attract new business, facilitate progress, and speed economic development. Supported by Motorola's 75 years of global wireless leadership, you can move into muni wireless broadband with confidence. Since Motorola's MOTOwi4™ portfolio of solutions is available now, your community can begin welcoming new business in months, not years.
Call 1.866.515.5825 / International 1.800.795.1530 or visit us at www.motorola.com/canopy/meshsolutions
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STREAMLINE
PUBLIC SERVICES
THIS YEAR
Public safety may be the most important service a community provides. But others, like public access and public works, are crucial as well. A Motorola Mesh Solutions network helps make all your public services more effective and less expensive through instant communications that drive more efficient use of resources and employees. With the support of Motorola's 75 years of global wireless leadership, you can move into muni wireless broadband with confidence. Since Motorola's portfolio of solutions is available now, your citizens can begin benefiting from streamlined public services this year.
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